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ABSTRACT

This workbook contains suggestions for environmental learning adventures for elementary school children in a forest. The activities are classified under various concepts such as sound, growth, adaptation, force, variety, water, habitat, design time, and conservation. The concept is first defined. Then a preparation exercise to get the students actively involved in the subject is presented. This may be a conversation about familiar things or an inside preparation game. Under the concept heading, the handbook provides a series of games, exercises, and explorations designed to let the child experience that concept. (SB)

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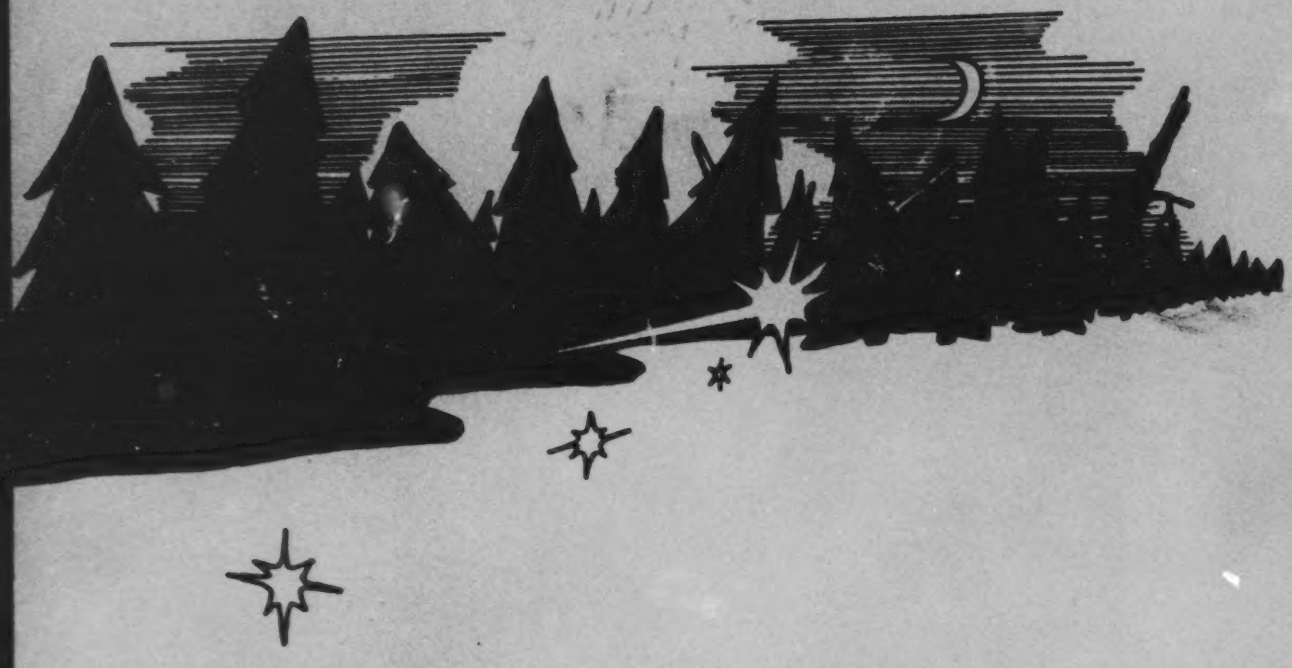
MAGIC from the woods



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a teacher's handbook for environmental education

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magic from the woods

by

Mark Warren

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AUTHOR'S NOTE

I have tried in writing this booklet, to create something new and ready for use. There are books on nature study, science projects and experiments; there are even books dealing exclusively with environmental issues and exercises. But I don't know of a book like this one.

This volume is dedicated to all of us who recognize the worth of showing to children the lichened, feathered, furred marvels that silently govern us from their places in the forest ... and to the forests themselves, diminishing islands of green that persevere in the sea of shopping centers and highways. This dedication reaches especially far back to Merlyn, who saw fit to educate young King Arthur by turning him into a fish, a hawk, an ant, an owl, a goose, and a badger.

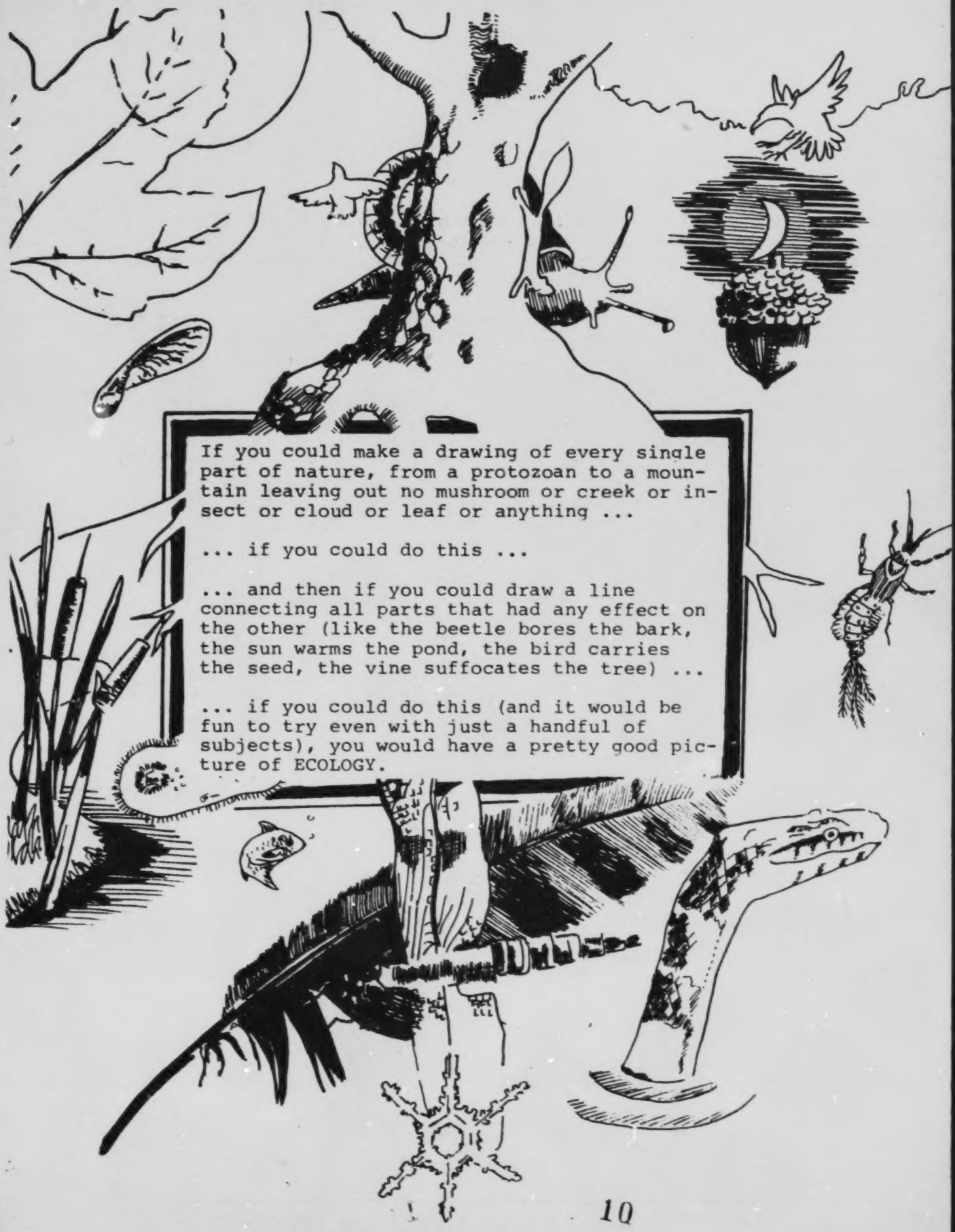
- Mark Warren

There was a time in Old England when a marvelous magician named Merlyn found himself caught up in a monumental struggle to civilize his country. England needed a leader to unify her many power factions into a single nation of peace.

Merlyn had all the necessary ingredients to accomplish his task. A promising, young boy named Arthur would be his king. Education and magic would be Merlyn's tools with which to mold Arthur.

As boys often will, Arthur periodically rebelled against geometry, history and the like in search of something with more meaning to his daily life. Frustrated, Merlyn inevitably resorted to the surest means of education known to him. As a brilliant tutor he knew that lessons of life are best found in nature; and as a magician he could transform Arthur into different animals so he could experience these lessons. So the truth that Merlyn relied upon for Arthur's tutoring really came from nature itself.

It was Merlyn's magic that stood Arthur before the great window of nature, but as for the magic that made for England a good king ... well, that was MAGIC FROM THE WOODS.



If you could make a drawing of every single part of nature, from a protozoan to a mountain leaving out no mushroom or creek or insect or cloud or leaf or anything ...

... if you could do this ...

... and then if you could draw a line connecting all parts that had any effect on the other (like the beetle bores the bark, the sun warms the pond, the bird carries the seed, the vine suffocates the tree) ...

... if you could do this (and it would be fun to try even with just a handful of subjects), you would have a pretty good picture of ECOLOGY.

for whom is this book?

These games and exercises are for every age - kindergarten to college to older folks - with necessary modifications. For the youngest groups, the ideas remain but the adventure has to be greatly simplified. This booklet aims at the upper elementary teachers and leaves it to the teachers of younger children to whittle down the complexities to a basic form. Teachers of older groups need not embroider the game. The ground rules should suffice. For instance, a first-grader and a tenth-grader can both be told to draw a tree. Each may justify in his mind the reason for the lesson and approach the problem equally industriously. The young child pulls out his crayons and tablet and loses himself while the young adult pulls out his soft lead pencil and sketching pad and is every bit as absorbed. They do the same exercise; the results simply reflect different maturities.

what's in this book?

1. First, let's share a few philosophies. These include suggestions on how to anticipate the forest, how to approach the forest, how to deal with questions, and how to initiate curiosity.

2. A section on sensory development will give the students their tools for adventure.
3. The real meat of this text will be handled in this way. A concept will be introduced such as: adaptation, habitat, the water cycle, conservation, etc.

   This concept will first be defined as we know it within nature study. Next comes a preparation exercise to get the students actively involved in the subject. This could be simply a conversation about familiar things or an inside preparation game.

   Under the concept heading, the handbook then provides a series of games, exercises, and explorations designed to let the child experience that concept.

the goal

A teacher should have an inspiration and a means to teach environmental education so that, simply said, children will learn, have fun, and appreciate nature. Many of these exercises have no goal other than to get the child out of his/her own existence and realize the existence of other things. Or, in some instances, a purpose will be to use senses that have been dulled by lack of use. These sharpened senses will be the child's tools with which to explore.

the treasure

Most of these exercises result in some tangible relic (drawing, craft, leaf, poem, etc.). Have each child keep a folder to collect these treasures.

philosophy

The approach to the forest should be very special since the forest is a special place. There will never be a lack of study material in the woods. Think of all the things constantly going on there: birth, growth, death, leaves fall, seeds fly, hills erode, pine yields to hardwood, alluvial soils build beaches.

The teacher sets the pace. If the teacher explores, probes, and shows curiosity, that is enough. This enthusiam can be kicked off inside the classroom.

CREATE RESPECT - Discuss parts of the forest that can do things that we can't. Pick anything and you'll find some amazing quality. Ask your class: "Can you eat a rock? ... a lichen can!" "Can you travel 50 feet through the forest in a few seconds without ever touching the ground? ... a squirrel can!" "Can you stand your ground in a flood? ... an oak tree can!" "Can you jump twenty times your height? ... a grasshopper can!"

WE ARE VISITORS - The class members could never survive in the woods by themselves. They are not equipped to deal with rain and cold, and they couldn't know how to find food. But all the forest plants and animals can. So it is THEIR home. The forest creatures have homes in trees, in leaves, under ground, under rocks, under leaves, in logs ... everywhere. The challenge of the child in the forest is one of visiting without destruction: as you will find out in the science of ecology, every single forest dweller is important - a part of a very complicated puzzle.

WE ARE DETECTIVES - There is a story about a famous scientist who sat under an apple tree and "discovered" the force of gravity when an apple fell. This man was a scientific detective because he trained himself to think about things and ask himself: "Why?" Well, he didn't discover gravity; he merely reached a mental point where he could recognize and consider it because he was a detective. After all, gravity has always been around. Apples, acorns, persimmons, poplar seeds, bird feathers - they've all been falling to earth since the beginning of time.

The secrets exist out there. We have only to open our minds and be detectives. Take nothing for granted. Why are trees so structured? Why do leaves hang the way they do? Why do leaves have stems? Why are there pine cones? Why are pine needles bundled? Why do leaves fall? Why do snakes stick out their tongues? Why do squirrels have bushy tails?

Every single thing has purpose. If you can't see it, don't dismiss it as being without purpose. Chalk it up to ignorance that you can only try to learn the answer.

Never be afraid to say "I don't know." Let's not pretend that nature is a concise science bound between the covers of a book. It is the greatest source of mystery we shall ever encounter.

"What's this called, teacher?" This question arises so much that it eventually embarasses the teacher who can't answer. Be proud to say "I don't know." After all the name is not as important as finding out why it is so designed, what it does, how does it smell, etc. Make up a name for it with the kids until you or someone comes up with the research that reveals its true name. Then combine the two names to help the class remember their discovery. For instance, a snake you find has yellow stripes. Perhaps your class names it after that: a "Yellow Striped Snake." When you find out later that it is a garter snake, refer to it as "Stripey," the garter snake.

STORIES OF SUCCESS - Everything in nature is pushed toward success in design and function. Nature does this by random trial and error experiments called mutations.

Think of bird beaks. Certainly a hawk's hooked beak looks "deformed" compared to a robin's. But the genetic accident that caused that first curvature has persevered and been passed along by that lineage of hawks because its success as a meat-tearing tool produced a healthier more successful family.

Look at EVERYTHING this way and try to discover the reason for its design.

Allow the children to select a favorite spot somewhere outside to be known as Merlyn's Cave. It can be a place to draw, study, think, and write when the weather is nice. It is a real step forward to incorporate the woods (or just the schoolyard) into some part of school work.

sensory development

It's easy to SEE. We only have to open our eyes. Because of this effortless talent, we often deny ourselves how something smells ("You mean I have to bend over?") or feels ("You mean I have to take my hands out of my pockets?") or sounds ("What! You mean actually stop and listen?") or even tastes ("I'd rather not!").

This neglect of senses is probably related to the ease with which we can sit back and experience almost everything through television, radio, or motion pictures.

So we have a challenge for ourselves as well as for our students. Let's revitalize the lost senses.

As far as "feeling" goes, encourage the children to touch with the whole body. Feel things with feet, cheeks, arms... not just fingertips. And as far as "taste" goes, NEVER put anything into the mouth unless it is known to be edible.

Here are a few games to use:

1. Bring about five different foods to class. Let each student have a taste blindfolded. With pencil and paper (still blindfolded) they will attempt to write a one or two word description of the tastes in the order they are sampled.

   Next, in a different order, let them smell the foods and match them up to their description of them.

2. Form a circle on the floor and place an object in the center like a piece of styrofoam, metal, something rotten, etc. After visually studying the subject, the students describe in a few words how they think the subject feels.

   Blindfold them. Pass around an object. When all have felt it, hide the subject and have them draw how it looked.

   Pass around another item. They must study it at arm's length. Hide it. How does it smell?

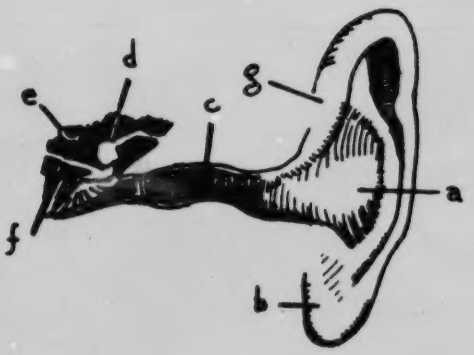
   Blindfold them again. Drop an item on the ground. How does it look by its sound? Or how does it feel by its sound.

3. Give each child a rock or stick and ask her to sit on the floor with the item behind her back. The child should never look at the subject matter. By intensive touch the student draws on paper an actual-size, detailed picture of the item.

   Collect all the items after the artwork and see if each child can identify her rock or stick.

4. Outside, let the class pair up into teams of two. One team member is blindfolded while the other guides the blindfolded friend to any spot so desired. All along the way the guide stops to allow the other to feel some object with unique texture (like a spider web or sycamore trunk), then to smell something with a unique odor (rotting log, ginger, pine needles) and then to hear something (like a magnolia leaf being crumpled or water being splashed). Use as many clues as necessary to insure that the blindfolded child can find her way along the same trail when the blindfold is removed. This is done when the guide has returned the friend to the starting place. Clue by clue retrace the mystery path re-enacting along the way the sensory methods of touch, sound, and smell. After success, the guide becomes the blindfolded.

Sound



We all know what sound seems to be. Actually sounds are air waves that were stirred up by something and find their way to our ears. Did you know that if the waves fizzled out before finding somebody's ears, there is no noise. A tree falling in a forest makes no noise unless an animal is there to hear it. That's like saying a cup of hot cocoa doesn't taste good unless someone drinks it. I think we might get an argument from a snake, who doesn't "hear" but certainly feels the waves just the same. Sounds vary in pitch (highs and lows), timbre (type of sound: flute or trumpet) loudness, how long they last, and how often they come.

preparation:

Have the children close their eyes and put their heads on their desks. Create several sounds (book dropping, pencil sharpener, drawer sliding) and let them identify.

Listen in silence for sounds (electricity, airplane, wind, other classrooms, heater, air-conditioner).

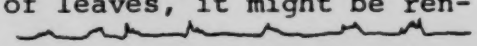
Discuss what sounds they expect to hear in the forest.

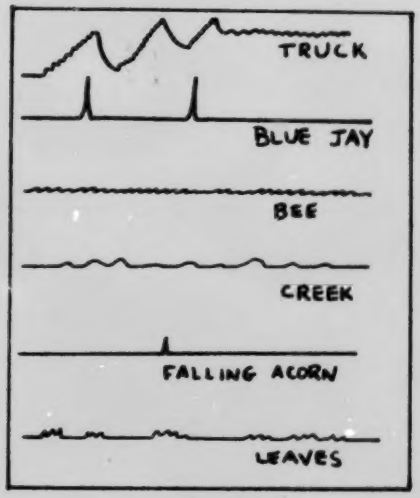
the stampede

Secretly take a battery-powered cassette into the woods and turn it to "Record." Go back and get your class. Have the class enter that forest. You need not tell them of the trick. Back in class, rewind. Play for them the peaceful beginnings and let them listen for forest sounds and try to identify. When the flood of children's voices imposes itself, there may be a lesson gained with never a word from you.

What kind of impact does a group have on the forest?

sounds of the forest

Take tablet and pencil into the forest. Sit quietly as a group. Everyone listen for the quietest sound. On paper at the bottom of the page try to graphically represent this sound as if you were a sound detector machine. For example if you hear a faint rustle of leaves, it might be rendered thusly:  Write under it what you think it is. At the top of the page, do this for the loudest sound. Fill in between with as many sounds as you can hear with louder ones near the top.



the concert

Make a tape recording of actual forest sounds. Back in the classroom assign each student the task of mastering the imitation of one forest sound. They must reproduce timbre, loudness, pitch, how often it comes, how long it lasts.

After practicing, try simulating on tape your home-made forest.

the stalking game

Walking quietly in the woods requires two qualities: patience and strength. One leg must support the body while the other leg's foot probes the forest floor for a soundless spot. When it is found, the foot slowly adheres to the ground and the weight of the body is carefully shifted forward to repeat the procedure with the opposite foot. If the probing foot seems to have chosen a poor spot as the weight is beginning to shift, the

stalker should be able to return his/her balance to the back leg for selecting a quieter spot with the probing foot. Blindfold one person and have the remaining children surround him/her in a circle about twenty yards away. At the teacher's signal the stalkers attempt to approach the center person. This blindfolded person uses sound to eliminate the stalkers: for as he/she hears someone, the blindfolded child points. If the point is true, that stalker must "freeze" until the pointer makes three consecutive bad points. At that moment the "frozen" stalker may continue. Teacher will assess accuracy of points.

a poem

One of the nicest sounds made by people is poetry. Try to put words together in such a way that you capture the feeling of a place or thing. Pick out a few key words and build around them to make a short poem.

valley: dark, cool, mysterious

The dark valley is a cave
with the sky for its roof.
't pours a cool wave of mystery through my bones.

growth

Growth can only be known as a miracle. It is the quest of a living thing, plant or animal, to struggle for food so that its body matures and enlarges to a size that nature considers its ideal size. A body is not smart enought to say "I want to grow," so nature makes it hungry now and then so that it will eat regularly. In many ways growth is already planned for an animal or plant when it is born. There are tiny controls (genes) that are inside young seedlings or baby animals that determine how the adult plant or animal will be. Its body will go through planned changes at certain times of the year, (like a bush growing berries, or a snake shedding its skin) or at certain times of its life (like changes in color of the bald eagle or the changing of your voice when you are a young adult). Or course, nothing is for sure, and life is a gamble. What if a fox stepped into a steel trap so that a man could cut off his skin to make a fur coat to be sold in a store? Or what if a plant was infected with chemical pollution? Many changes can occur which "interrupt the regularly scheduled program."

preparation:

1. Dare to bring to school a picture of yourself as a child. Have the class do this also.
2. Start a height chart for students and check it periodically.

adopt a twig

A good springtime project is to select a budding twig on a tree and tie a red ribbon around it about one foot from its tip. Tie another ribbon midway between the tip and the first ribbon, measuring with a ruler the two 6" lengths. Draw a picture of the twig and buds.

In a week return to your twig and make a new measurement and drawing. After a few weeks you will have learned how a limb grows and you will have a pictorial study of how a bud unfolds and reveals its package of leaves. File this away in your "Adventures in Nature" folder so that later you can add to it a mature leaf from your twig.

the incredible hulk

Did you know that a plant is considered successful if it can do two things? The first one is to make food. As you know, food is energy, but what you might not know is where food gets its energy. This will sound like magic, but probably that's as good a way to think of it as any. Food gets energy from a star! We call this star the sun. Sunlight has warmth, light, vitamin-producing properties, and it also carries energy. Only one living thing can put this energy inside itself - a green plant; that's why I call it the incredible (Green) Hulk. When you run, talk, or even breathe, it takes energy. Maybe your energy is from a supper of roast beef and carrots. The beef is cow muscle. The cow stored energy that it got from the grass that it ate. The grass, of course, is the incredible hulk, just as is the green carrot top. The energy all comes from the sun.

Dig up two small green plants (weeds will do) and place each in a separate cup. Put one in the dark (a closet) and one on the window sill or outside. What happens? If you start with seeds, the "dark" seed may grow taller faster since it is seeking light. It is using food and energy that was stored in the seed. But with time it will fail.

seeds on the go

The other thing a plant must do to be successful is to reproduce - or make more of its own kind just like your mother and father made you. The plant must therefore make a good seed and give that seed a way to travel to a sunny spot. (The parent plant would make shade nearby).

Seeds travel in fascinating ways:

1. Roll away.
2. Fly like helicopters.
3. Stick to animals.
4. Attract animals to eat them (like birds) to be dropped later.
5. Be carried by the water.
6. Get pushed like dust in the wind.
7. Jump off the plant.
8. Get collected by animals who store them as food.
9. Drill themselves into the ground.

Let's make a collection. Find a seed that travels each of these ways.

professor seed

Let the seeds of "seeds on the go" be your teacher. See if you can do what nature has done and make your own seeds (using craft materials: paper, scissors, glue, pipecleaners, rubber bands, etc.) that travel in just the same ways.

the sneaky seed

So you think you know seeds pretty well? Dig a cupful of dirt from the ground. Carefully sort through it and remove every last seed, no matter how tiny. Replace the dirt in the cup. Water it a little and let it stand in the sun - perhaps on your windowsill. If something grows, make a drawing of it and try to find another outside in the wild. You'll remember this as a pretty determined plant with a sneaky little seed.

Adaptation

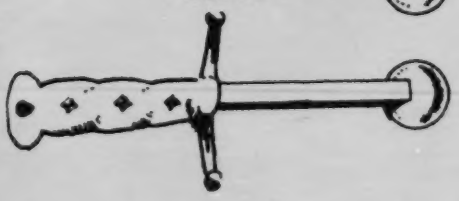
There is a secret, silent drive by nature for all living things to be as successful as they can be. Nature is always experimenting to find better traits for them. There experiments are random and occur in the genetic material of a new-born life. If a bird was born with beak halves that flared away from one another, that certainly wouldn't be a useful beak. But say a bird beak was "deformed" like a hook; that bird could conceivably rip the flesh from its prey. Both birds have a chance to show off their advantage or disadvantage, but the flared beak bird is likely to starve and never pass on that trait to offspring while the hooked beak bird excells at feeding, hence it will be healthier than most, and so establish that trait in his bird children, grandbirdchildren, and eventually, his species. This is called natural selection.

Feeding is by no means the only topic in adaptation. There is also an animal's or plant's ability to hide, defend itself, discourage attack, frighten, travel, co-exist with others, etc. So colors, structure, and function are important too. EVERYTHING THAT EXISTS TODAY AS A FEATURE MUST HAVE A REASON.

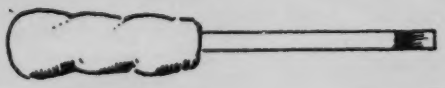
preparation:

1. In the class, take a look at all the ways we adapt ourselves artificially, that is, not by nature. How do we keep warm, keep cool, improve our vision, improve our teeth alignment, improve our appearance, protect our feet from abrasion, etc.
2. Examine your own bodies. Take a look at obvious features and determine why they are designed this way: thumbs, scalp hair, ventral nose and posterior nostrils, eyelashes, eyebrows, fingernails, ears, etc.
3. Using slides, pictures, or books, look at plants and animals of varying shapes and colors and discuss why they might be so designed. Why is a worm segmented like an accordion? Why do bees have hairy legs? Why are most snakes multicolored? Why do trees take the shape they do? Why are there stickers on some vines?
4. (A discussion using drawings on the blackboard) To show how nature goes through its trial and error method of perfecting things, pretend you are an inventor of long ago. You are trying to invent the screwdriver (someone already invented the notched screw). You might start with a coin. But that hurts the hand, and it's too close to the screw. You slide the coin halfway into a notch on a stick. It starts to work, though it is hard to turn, but the stick breaks. You try metal. You get a blacksmith to encase the coin halfway on the tip of two metal rods.

It works but it still hurts the hand. So you wrap the handle in leather. Not only is it more comfortable but it's easier with a bigger handle. You attach a sword handle.



It works great, but eventually the coin prys off. Finally it occurs to you to not even use the coin but flatten the end of the metal shaft.



This is the way things slowly get improved. There is a story like this for everything: a rabbit's ear, a hawk's beak, a pine's cone, etc. Can you make up their stories?

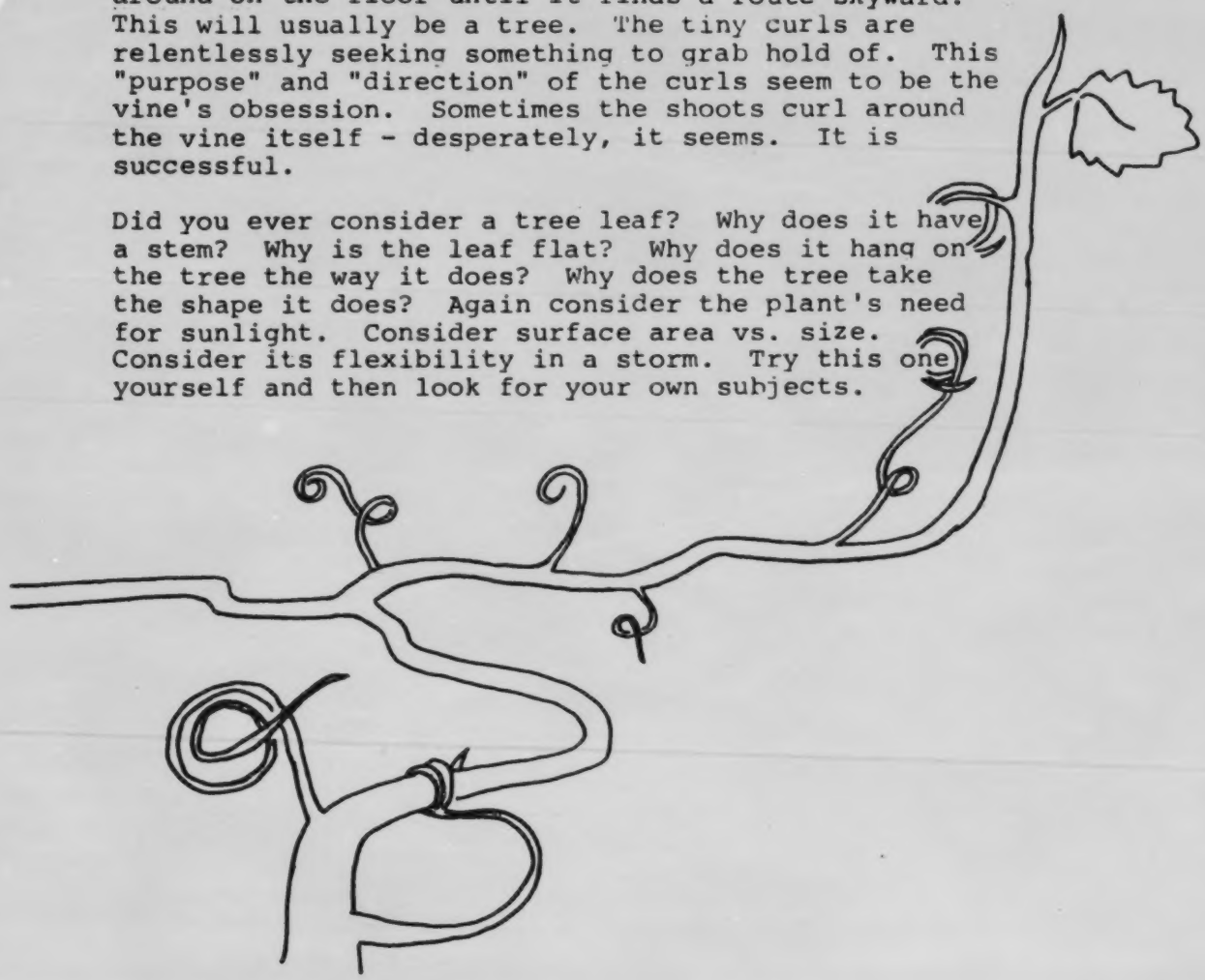
success !

This may be the singlemost important exercise in this booklet. All that is needed is curiosity and imagination. Go in search of anything in nature and try to understand why its design is successful. Remember, EVERYTHING clearly exhibits its success if only you know how to interpret it. Here's an example or two:

Everyone has seen the curly shoots of a vine wander from the main stalk. Is this successful?

A vine, of course, needs sunlight but lacks a backbone to stand tall in the forest. So it rambles around on the floor until it finds a route skyward. This will usually be a tree. The tiny curls are relentlessly seeking something to grab hold of. This "purpose" and "direction" of the curls seem to be the vine's obsession. Sometimes the shoots curl around the vine itself - desperately, it seems. It is successful.

Did you ever consider a tree leaf? Why does it have a stem? Why is the leaf flat? Why does it hang on the tree the way it does? Why does the tree take the shape it does? Again consider the plant's need for sunlight. Consider surface area vs. size. Consider its flexibility in a storm. Try this one yourself and then look for your own subjects.



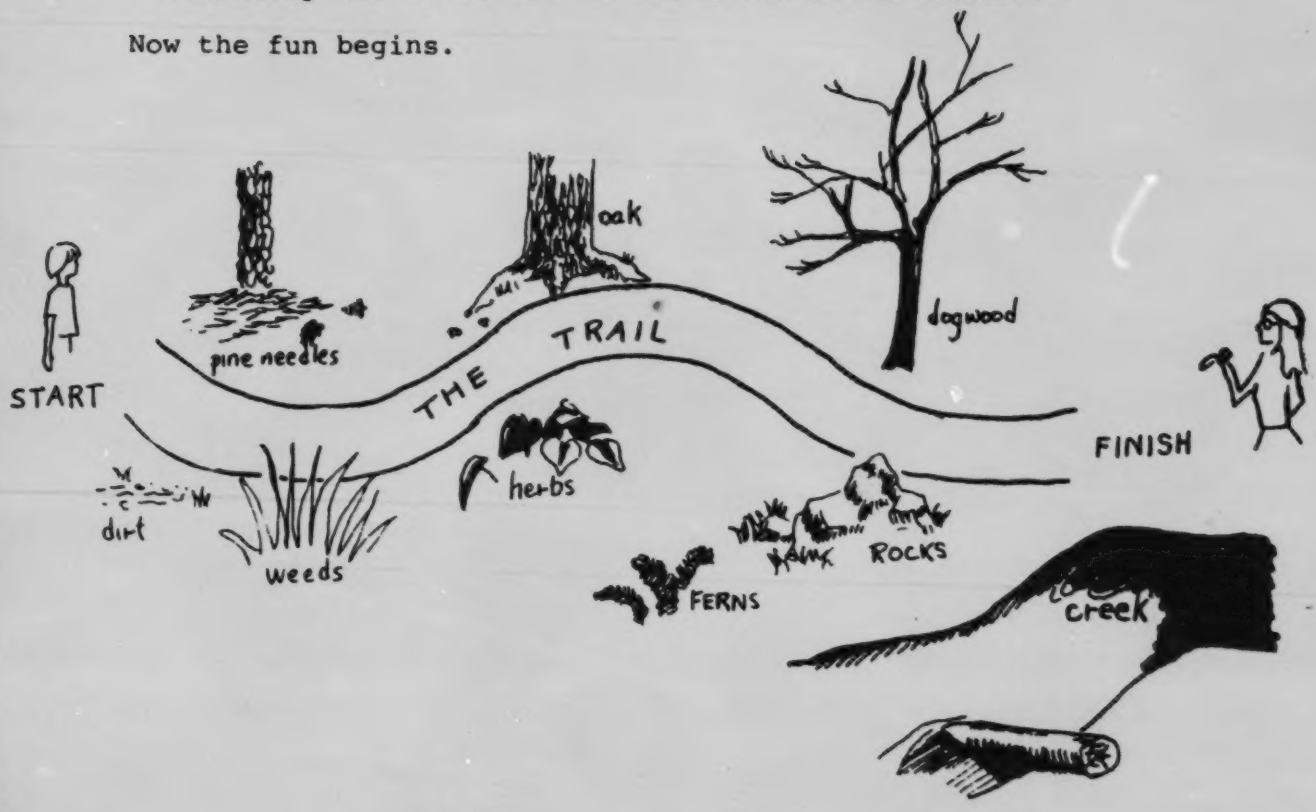
camouflage game

First, go rope off a trail about 30 yards long. Choose a site that offers lots of different kinds of "mini-environments". For example, along your trail perhaps there are a pine-needled floor, a fern bed, rock outcrops, a weedy spot, some trees (large and understory type), maybe even a stream, etc.

Each child must secretly choose one mini-environment (no more than 10 feet from the trail) in which he or she will hide an animal. Back in the class or at home the child constructs a creative animal. Make the animal of craft materials (processed wood, glue, pipe-cleaners, construction paper, whatever; no natural materials allowed) that will blend into its chosen habitat. An animal that dwells among a pine-needled floor would be camouflaged in linear brown stripes, for example. Animals must be as large as one's palm.

When the time comes to hide the animals, one at a time, children must go in quickly to their spot, hide the animal, and hide 3 peanuts behind the animal (If the animal is attached to a tree, peanuts are hidden behind the tree at its base), and then come immediately out so as not to see other hidden animals.

Now the fun begins.



Teacher, at trail's finish, gives each "predator" (child) about 10 or 15 seconds to cover the entire trail. As they travel they look for "prey". Only when they spot an animal may they leave the trail and pick one peanut. If they don't make it to the finish by the given time, the "hunter" (teacher) catches the "predator" (child) and gets his peanuts.

The game is instructive in several ways.

1. Good camouflage is successful (prey retain peanuts).
2. Poor camouflage is unsuccessful (prey lose peanuts).
3. Sharp predators stay healthy (predator gains peanuts).
4. Unobservant predators go hungry (predator gets no peanuts).
5. Unwary predators get trapped (slow predator loses peanuts).

tools to survive

for a small group of 6 or 7

Prepare a sack with a large variety of tools and implements (spade, scissors, nylon cord, tongs, spoon, pliers, etc.). Let each child, without seeing, pick a tool.

From this list of "missions" have each child attempt them, one by one, using his tool.

1. Dig a 6 inch deep hole.
2. Browse the outer 1 inch of pine needles. (Browse means snip off.)
3. Carry round nuts (golf balls) to a storage place 50 feet away.
4. Build a protective cover overhead.
5. Construct a trap to catch prey.

Discuss what tools were most helpful after each mission. What animals or plants have similar features or missions?

the fox's nose

By a wave of Merlyn's wand turn one or two children into foxes, others into eagles, and caterpillars.

Emphasize the specialization of the fox's nose, the eagle's eye, and the caterpillar's antennae.

Let's see how good the fox is without his nose. Hide a perfumed mouse in the woods out of sight. (The mouse, of course, is homemade.) Let the foxes hunt for him but without ever bending over to really smell. After failure, allow the foxes to sniff the ground until they meet with success.

Ask the eagles to perch and search for a homemade rabbit hidden well into the woods, but in view. After failure, give them their eagle eyes in the form of binoculars.

Blindfold the caterpillars and ask them to crawl through a maze of basketballs or kickballs without letting the balls contact their skin. After failure, give them their antennae in the shape of a stick or rod fastened into their blindfold-knot.

goofy genes

In one box marked "accidents", place slips of paper with genetic accidents like:

1. born blind (blindfold)
2. born without touch sense (gloves)
3. born with hairs connecting wrists (rope)
4. born with no thumb (tape)
5. born whistling, can't stop
6. born Siamese twins (rope, tie legs)
7. born with long, tough fingernails (stake)
8. born without nose

In another box marked "occupations", place slips such as:

1. gather nuts
2. climb trees for leaves out of reach from ground
3. dig holes
4. collect different kinds of leaves (no two people can pick the same kind)
5. go from tree to tree collecting bark types
6. gather sweet smelling things

Divide the class into two groups. Each group (say 8 or 10 children) picks one "accident", but both groups get the same "occupation". The random combinations mirror nature's random methods of species improvement. Let the group hurry about for a time limit, trying to do their occupation the best they can - then talk about how they were helped or hampered by their genetic accident.

example: Group A picks "born blind" accident.
Group B gets "fingernail" accident.
Teacher draws from "occupation": dig a hole.

One accident obviously is good.

the force

Earth is never stagnant. It spins like a top; it clutches to its path around the sun and sails through space. Mountains build or erode; valleys wash away with a river; lichen eats away at a boulder; seasons change; things are born; things die; plants and animals evolve; winds blow; waves crash; creeks flow; seas evaporate; clouds journey; rain falls; ants push along crumbs of food; protozoa break apart cellulose in a termite's stomach. Look out the window - consider every thing you see - how is it changing?

What keeps the system moving? Here is a good opportunity to discuss religion if so desired.

hickory, dick, and doc

In every ecosystem are producers (green plants which make food), the consumers (which eat the food), and the decomposers (which make things rot so that the soil is assured of fresh building parts for new food).

In this game, our producer is a tree - Hickory.Our consumer is a squirrel - Dick. Our decomposer is Dr. Mushroom. Hickory trees get food parts from the ground to make food - hickory nuts. The tree holds out the hickory nuts on its limbs for the squirrel to take.

The squirrel eats the nut and throws away the shell.

Dr. Mushroom helps the shells to rot so that they go back into the ground where the tree roots can absorb them again to make new nuts. They all depend on each other. This is called inter-dependence.

The game: Divide the class into Hickories, Dicks, and Doctor Mushrooms. Use nuts or marbles or golf balls as hickory nuts. If you have 21 children use 7 nuts. Distribute them randomly after the children are blindfolded.

All Hickories who get a nut must hold it in their hand like a tree holds the nut on its limb. All Dicks, the squirrels, who get a nut must put the nut into their pockets as if the squirrel has put the nut in its stomach. All Dr. Mushrooms who get a nut must put it under a foot and stand lightly upon it.

At the start of the game if a child has a nut, he stands fast, waiting to be robbed of it. Hickories may take food only from Dr. Mushrooms, so they may search for food only under their feet. Dicks, the squirrels, can take food only from Hickories so they may search for food only in hands. Dr. Mushroom can search only pockets.

Go!

Every 60 seconds blow a whistle or ring a bell. Anyone without food must remain standing while those with food sit. Blow the whistle again to go.

If a child stands at the whistle twice in a row he has starved to death for lack of food and must step out of the system.

See what happens if all of one type die.

change

Growth means change. Nature is full of change: a fallen limb, an eroded bank, a chewed nut, a nibbled mushroom, etc. With pencil and paper, search for evidence of change. Make a drawing of your finding then on the backside draw what you suppose caused the change. Meet back together and have a discussion. See who agrees or has different ideas on cause and effect.

tree power

What do we make out of trees? Name everything ih the classroom that began as a tree (paper, desks, pencils, shelves, paint, soap, etc.). Is this why trees are important?

Trees seem so steady and patient and inactive, but they really do so much as they grow in the ground. Their contributions are quiet and inconspicuous. But "the force" is there.

1. They make food.
2. They provide homes for animals.
3. They provide weather barriers.
4. They provide shade.
5. They cool air by transpiration.
6. Their roots prevent erosion.
7. They make oxygen.

Simply go into the woods and experience each of these wonders.

the outpost

Make a journal of nature's changes at your school. Set aside a time every week when the class can go to a chosen spot (the outpost) and record like a scientist: sounds present, animals seen, temperature, smells, sights, colors, weather conditions, movements, even a poem about how the outpost feels that day.

Variety

What if you came to a town where all the townsfolk had the same job - say, they were all fishermen. Would this town be successful? There would seem to be plenty of fish, but who makes warm clothes for the storms at sea or boats? Who grows vegetables or milks cows? A town needs lots of different trades, just like a forest does. Let's simplify it.

What if the only plants in an area are ginger plants? The only animals that could live there are the ones that eat ginger.

Because there are so many different kinds of plants, there are many different animals. Each plays a part in making the forest a better place to live. Consider worms. Are they just bird food? By digging around in the soil (which they swallow and fertilize), the worms open up channels for air and water to help plants grow - like trees, which house squirrels and feed them too. By the way, trees are homes for birds, which eat worms. Complicated isn't it?

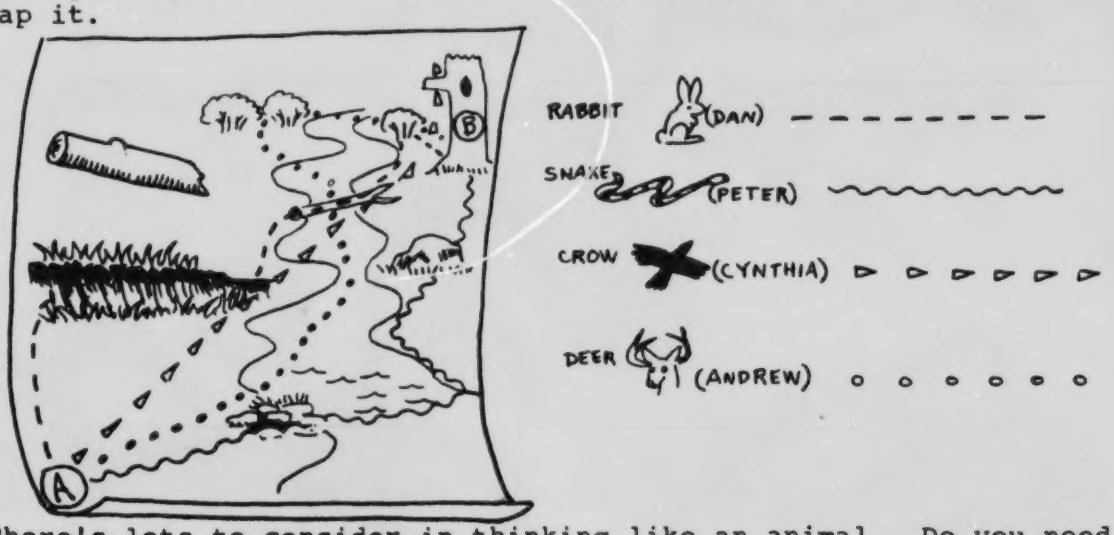
textures

Wearing a blindfold, move slowly through the forest and find things which can be separated by the way they feel. Collect samples in a sack. Back in class, paste these samples on a piece of paper. On a separate sheet write one word descriptions for each texture (fuzzy, slick, velvety, sticky, mushy, etc.). Cut these out as slips and let children exchange their displays and try to match up texture with words. Try it blindfolded first.

they went that-a-way

In class think up many different methods that animals use to get from one place to the other. Allow the children to demonstrate (worm, bird, frog, snake, deer, etc).

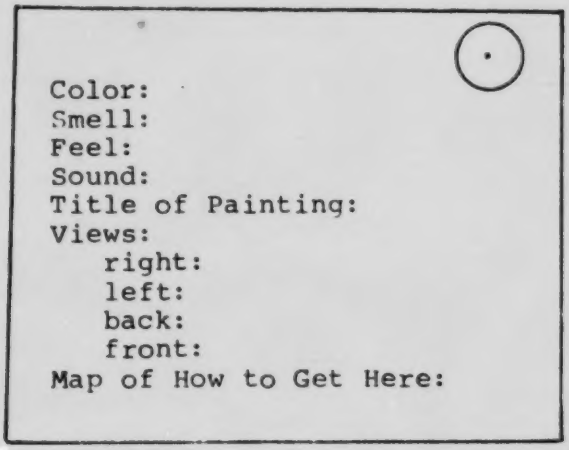
In the forest, make a big map of the area showing the more conspicuous land marks. Designate a starting place (A) and a destination (B) on the map. (Now let each child choose an animal he would like to be). Thinking like that animal and moving like it too, take the best route from A to B and then map it.



There's lots to consider in thinking like an animal. Do you need to hide or eat often? Are there parts of the woods you avoid or are fond of?

the magic orange

Give each child an orange, a toothpick, a tablet, and pencil. Each student will pick out a favorite spot in the forest, take a seat and describe their area using this form:



Stick the toothpick in the eye of the orange and use it like a sun dial. Draw the toothpick shadow on the form in the dotted circle just as it lies on the orange. This shows in what direction the child faced. Use two words to describe the categories: color, smell, etc. ("Title of Painting" means this: If this scene were a painting, what would it be called?) When they are finished writing they may eat the orange. Bury the peeling under dirt but leave the seeds in a pile on a leaf.

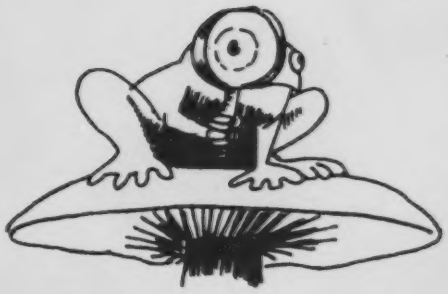
When all have assembled together exchange forms and try to find each other's magic orange spot. Toothpicks can be used directly on the circle to decide in which direction the writer faced.

If a searcher is accurate (and lucky), he may find a pile of seeds nearby.

tracking with the senses of a wild animal

This takes a full hour of preparation on the teacher's part, but it is an hour you'll never forget. Ask a friend to join you for the preparation - it's fun ... maybe prepare on Sunday for a Monday game.

Go into the woods to a starting place. Look around to see what feature suggests itself for use. For example, from the starting place you spot something unique - an umbrella magnolia tree with its huge leaves. Let this suggest your first clue to be left at the starting place:



Clue #1: "You are a brightly colored woodpecker and you see a hawk flying overhead; you need good leaf cover. Where do you go?"

When you have written this, store it in a film cannister and leave it at the start. Go to the magnolia - look around. Maybe you see one sunny spot at a distance. You think:

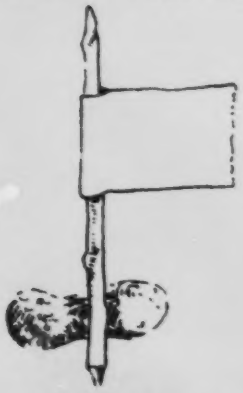
Clue #2: "You are a bobcat who has traveled through a swamp for three days. You desperately need to dry out the pads of your feet. Where do you go?

Leave this clue in a cannister at the magnolia and move on to the sunlit spot. Make clues as obvious as possible. Use your imagination. (A hint for younger children. Don't use written clues or cannisters. Let them go anywhere they decide, whether it seems a good choice or not. That is, if they miss the magnolia and run to a poplar, go with them and read the next clue from your own notes.)

It might be worthwhile to end the hunt with a treasure of some kind.

museums

Have each child make three small flags using sticks and colored tape. Take flags, string, and peanuts into the forest. The children will select museum items in an area about 10 feet by 10 feet. Tie off with string the boundaries of this museum. Use the flags to mark such assigned items as:



1. an amazing structure
2. a process going on
3. a pleasant smell
4. a weird-feeling thing

etc.

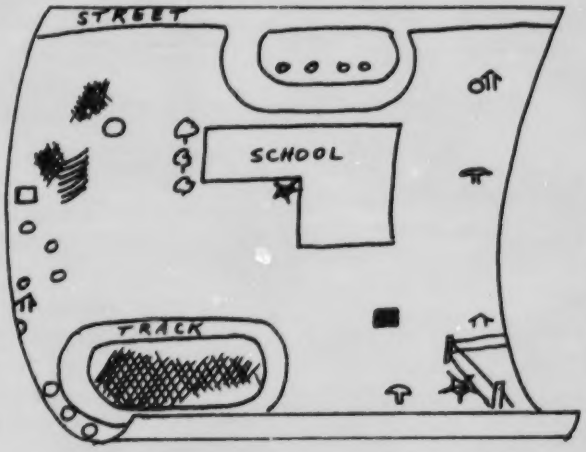
Let the museum owners advertise and open for business. Everybody gets three peanuts. It costs a peanut to visit a museum.

Steve Van Matre, author of Acclimatization, originated this idea by challenging children to seek out natural items of interest in any category. The possibilities of this exercise are endless, whether the child discovers the category or the teacher assigns new, innovative categories.

map your school grounds

First make a general layout of the grounds, then assign a feature to each student to fill in on the map.

slope
dandelion
spider webs
tree
coolest place
warmest place
weeds
rock
bare dirt
bush
animal home
mushrooms
etc.



Water

The Earth is a spaceship. All of Earth's supplies are on Earth now. And because of gravity it is impossible to throw anything away. All of our garbage shows up somewhere - like a beverage can you find along the path. Perhaps the person who drank the contents will never see it again, but there it lies before your eyes.

The easiest commodity for us to dismiss may be water. Because it so easily pours from a pipe in our home and so easily spirals, dirtied, down a drain, it seems so cheap and endless! It's not! Spaceship Earth runs the same waters over and over - down the creek beds or through the sewers or out the showers or through our bodies and in our soft drinks and water fountains. Who cleans it?

Nature does, in part. But we dirty it far and beyond nature's ability to clean - so mostly it must be people who clean water - or else decide not to dirty it to such an extent.

If you have a creek nearby, that would be an excellent place to discuss water. Where does it come from? Follow it to its source. Where does it go? Get a map of the area. Where does the creek go eventually? Does it ever supply water to your city?

Your creek originates with rain, as surface runoff or as groundwater. It flows to a river to an ocean. There the sun evaporates water to form clouds which travel back over the land. This is the water cycle.

the long journey

Have each student be a raindrop and select a place to fall to Earth. Have them crawl the course that a droplet would take. They should linger at plants which would absorb them and then transpire them back into air and so to ground. Eventually all will meet at some common ground. Talk about your adventures. Was somebody swallowed by a grasshopper?

This is a good time for looking at a map to see what happens next.

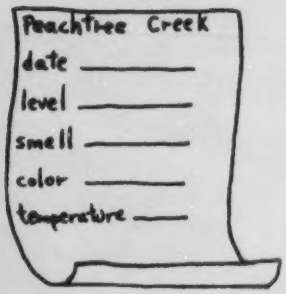
build a dam

Do it. A self instructive lesson on silt - dirt in water - and how any alteration of a stream causes increase in silt. Silt suffocates.

creek exploration

Smell, temperature, speed, sound, color, clearness, muddiness - explore them all.

Get an idea of life in the creek. Look under rocks carefully. Look on the rock itself. Use a magnifying glass. Look for homes in the bank. Look for swimming animals and surface insects. (Many flying insects begin as underwater larvae - dragonfly, mayfly, etc.)



Some water beetles use eddies to move upstream. What is an eddy? Place a large rock in current and figure it out.

Blindfolded, try to find your way upstream beetle-like by feeling water current with your hands.

Look for bends that have swirled out dirt to form beaches.

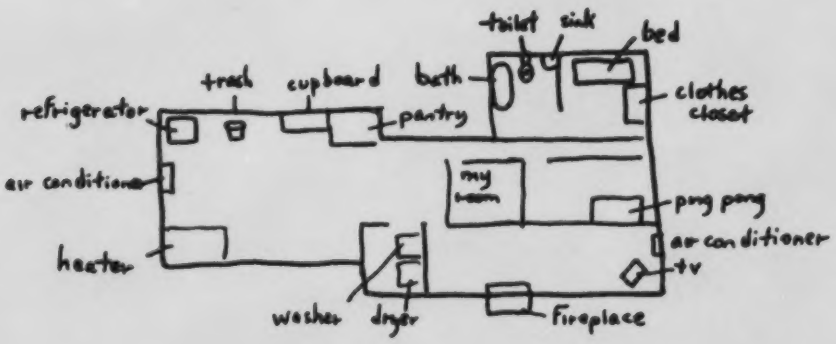
Walk the flood plain. It is the flat stretch alongside the creek. It absorbs water in flood and releases water in drought. Why would it be destructive to build a tennis court on a river's flood plain?

Make a water level guage and stick it in the creek. Check it from time to time to see how levels vary. When you do, have the children make notes on other characteristics of the creek for a creek journal.

Habitat

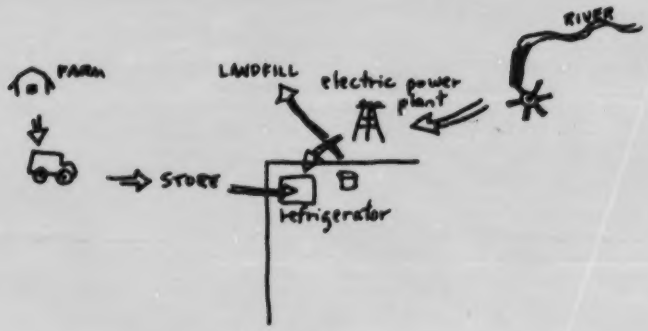
Where an animal lives is its habitat. Since animals which live in the same community inadvertantly do things for one another, interdependence is closely associated with habitat. Interdependence is experienced in a previous game entitled "Hickory, Dick,and Doc".

preparation: Discuss what a home is. What jobs do the children fulfill at home? What if nobody did that task? Have them draw a bird's eye view of their homes with the roof removed. This picture should show rooms, refrigerator, oven, fireplace, bed, sinks, toilet, trash cans, heater vents, air conditioners, fans, windows, clothes closet, bath, pantry or cupboards of food, tv., lights.



Now go into the forest with your drawing and look for a squirrel's home. Turn your paper over and draw the squirrel's home. Find and draw in the forest his refrigerator or pantry (food source), his trash, his bed, his air conditioner (cool source), his heater (warm source), his sink (water source) and bath, his tv. (recreation source).

Back inside the class, or sitting outside in a sharing circle, complete your own home drawing by showing the true nature sources of all your home items.



who's in my yard?

Do you know your yard? Draw a map of it and put in every tree, even what kind it is if you can. Take the map home and be amazed at your mistakes.

who goes there?

Take a guess at what meat-eating animals inhabit your school lot. Before leaving school make a mushy, muddy spot and leave a piece of meat in the center. Next day, perhaps you will find some interesting tracks.

home survey

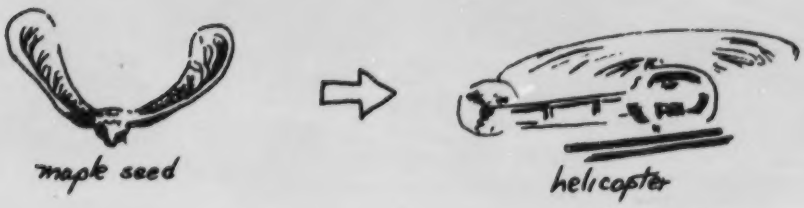
For a homework assignment, perhaps over the weekend, ask your students to search their yards or neighboring lots for animal homes. Make a list of animals that live there. Make drawings of animals whose names are not known. Remember that these animals choose to live near your house, so there must be reasons for their selection. Discuss what needs your neighborhood provide.

Design

It seems that nature got here first ... with all the best ideas ... and the most beautiful. An excursion into the woods can be devoted to design only. The variations are remarkable: a pine needle and sycamore leaf, dandelion and poke, a wasp's nest and a dirt dauber's home, beech bark and sweet gum bark.

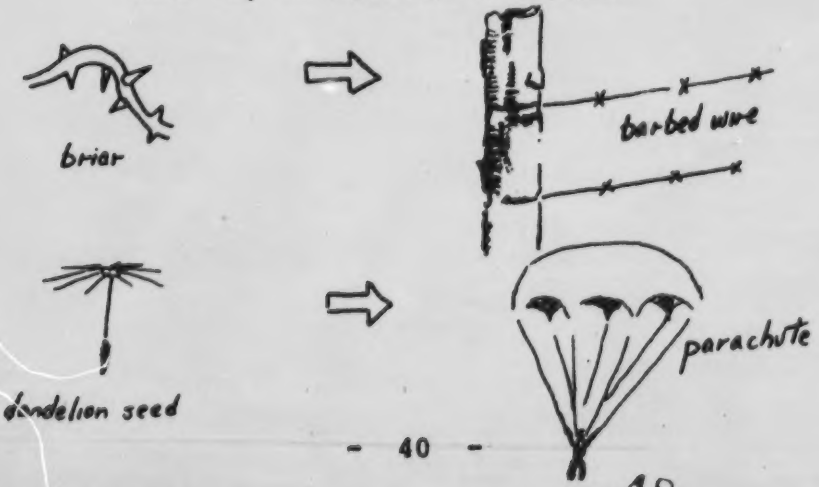
Remember there are definite reasons for every design. Sometimes the reasons aren't as obvious as a webbed foot or a landing platform of a flower to accommodate a bee, but theorizing can be fun.

preparation: Just about everything we see around us as "man-made inventions" are already old, established rules of nature.



Let each child bring into class some natural item (or picture) with an idea about what was invented from it. See if others can guess.

Another time bring in pictures of inventions and try to reverse the game.



metaphors

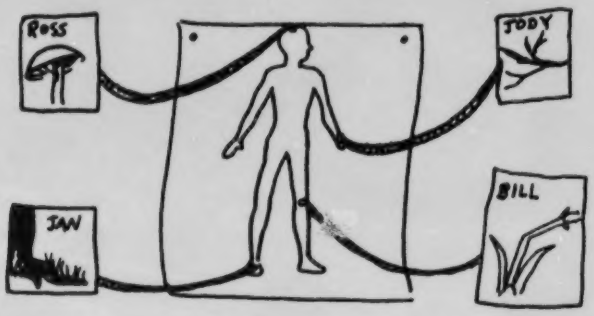
Nature has done it all, not only in inventions - but even in literature. I don't mean that a muskrat wrote Gone With The Wind first, but I do mean that the themes of literature exist in nature. Make a list of powerful words (beginning simply) like: beauty, ugliness, determination, frustration, loyalty, friend, etc. Assign each student one word. The child must seek out some part of nature which reflects this word: You then make a drawing and write its title on the drawing. For example, once an older student drew a spider and its web. The web was being rebuilt around a fallen branch, The title was "perseverance."

the forest is a giant me

There are things in nature that either look like or work like parts of our bodies.

Take drawing tablets into the forest and find something that reminds you of part of yourself. Draw it carefully.

Teacher can make a large poster drawing of a body. On the bulletin board, the nature drawings can be tacked around the poster with yarn connecting drawing with body part.



merlyn's wand

Every animal is an artist. Do you think of yourself as being a better one? Let's see. Teacher, find yourself a magic wand.

As Merlyn did to Arthur, teacher will turn students into various animals by a spell. (Why not read to them from T.H. White's The Once and Future King?)

If Wendy is turned into a robin her thumbs are taped to her index finger. If Jack is turned into a snake his arms and legs are bound. If Andy is a mole, he gets garden diggers. Each animal is now asked to perform the art work typical of its species.

Beavers build dams - carrying all dam parts by mouth.

Robins build nests using only one hand and mouth (the other bird foot is used to hold up the bird, right?)

Spiders must make webs using eight fingers.

Moles, blindfolded, dig holes, etc.

Traveling through the woods

How to do it ...

... with thought.

directions

Teacher can prepare this first exercise with directions: students will be able to perform the writing next time.

Simply go into the woods and work your way from one point to another with natural directions. Here's an example:

> Walk toward the sun until you see a small tree with leaves that look like mittens. Look for a red mushroom and go to it. Now travel downhill until the branches make you stoop. Follow the 3 rocks to a dead log. etc.

ropewalk

Blindfold everyone, and leading them by a rope guide them through the woods.

At the end of the walk, let them walk back over the land they explored.

robin hood trail markers

This is a method of traveling through the woods leaving secret markers as you go so that your comrades can follow you and others can't.

Each clue consists of an arrow (a stick with a forked end >———— point) and a clue. The arrow points in the exact direction you travel so all treks from clue to clue are straight lines. The clue shows the tracker where the next clue will be found. For example, an arrow with a cottonwood leaf

means to follow the arrow line until the tracker comes to a cottonwood tree. The clue at the tree may be a wet rock. Follow the line until you find water. There the clue shows a limb shaped into a treelike form with a vine wrapped around it. Travel this line until you find a tree with vine.

Time

Time that has passed on Earth is difficult to conceive. It is hard to believe that man's presence on Earth is minute compared to Earth's existence. It is equally depressing to realize how badly man has fouled the planet in such a short time. If a child could grasp this phenomenon - the passage of time - he would have better insight as to how his actions affect our environment.

preparation:

Show pictures of animals of long ago. Why are they not around or how have they changed? For example, beavers were once enormous, and horses were small. How long did it take for these changes to occur?

Use this thought on a child. Go back in time to the age of the dinosaurs. If you were born then, you could have lived your life 20 million times to get to this day. Do you realize how big even one million is? If you walked one million steps from Atlanta you would be in Arkansas. If you took 20 million steps and if you could hold your breath long enough to span the oceans you would travel around the world and then some.

Have the kids bring in pictures of themselves as babies. See if the class can match up baby pictures to present-day friends.

Bring in some childhood pictures of yourself, teacher, that's a dare.

time lapse drawing

Isolate any part of nature, ... a tree, a valley, a mushroom, a *dead branch*. At periodic intervals let a student draw her chosen subject, each time turning in the drawing to the teacher. Return them later, dated, to put in order to show growth, decay, or seasonal changes.

animals of the future

It may be good to begin by drawing an animal of the past and then one of the present. Make the children aware of changes in this area of study. Now pose to them the problems animals will face in the future: less wildlife habitat, air pollution, noise pollution, fouled streams, kudzu jungles, pesticides, etc. How will these factors dictate animals' features? For example, to breathe they will need good filtering systems and either huge lungs to compensate for less oxygen per cubic foot of air or less need for oxygen. Now spend some creative time drawing life of the future.

the time camera

Go to a favorite place in the woods with drawing pad and pencil. Take a seat and carefully study what lies in front of you. Consider what each thing looked like 50 years ago. Was this tree even here? Was the rock bigger? Was that log a tree? Was there more or less shade so that more or fewer plants grew here? Was the valley deeper? Were there different animals here?

Set your time camera to 50 years ago and take a picture! Your imaginative drawing will be your photo.

Set your time camera to 100 years in the future!

Turn your camera around and take a picture of yourself set 20 years in the future.

Conservation

Conservation is simply not being wasteful, but the trick of it is to be educated about what is scarce or what could become scarce.

If ecology is understood, conservation is the next obvious step. In other words, if a child has learned that a mushroom, as a decomposer, is an important part of the forest, he would probably not dash it to pieces with a thoughtless kick. This is conservation. If a child understands the soil-holding property of a tree on a mountain slope and if the child knows that paper is made from trees (many of which are cut down in the mountains), then he may become more conscientious about paper - relating wasted paper to

the needless harvest of a tree and destructive silting of a mountain stream.

Conservation is necessary because we have developed bad habits which dangerously affect our planet Earth.

land use game

preparation: Almost everything we do has repercussions on Mother Earth. What's the story behind our every day acts? Discuss them. What happens when we brush our teeth? When we buy a candy bar? When we ride to school?

Research with your class the way of life of the American Indian. How did the Indian's worship and respect of nature make him a conservationist?

Two preparations are necessary. On paper tags, write out enough "occupations" for each child to have one. Nuclear power plant, whitewater rafting, library, chemical plant, fishery, mountain climbing school, school, dairy farm, forest ranger, chicken farm, auto race track, hospital, quarry, musical concerts amphitheatre, hunting lodge, airport, hydroelectric plant, oil refinery, deep sea divers club, nature photographer, etc.

Also, beforehand, prepare a plot of ground 6' x 6' so that it is a scale model of many ecosystems: mountains, river valleys, floodplain, swamp, desert, rock-outcrops, hardwood forest, coast, ocean. Mold mud and dirt and use sticks and rocks to create the landscape.

Let the children surround the landscape and take a look. Introduce them to the different natural areas in detail.

Each child randomly and secretly takes an occupation tag. After all have an occupation, tell them to look again at the landscape and think about what they will need for their job. You could help them with this by suggesting: Will you need a raw material from nature? Do you have to be in a certain ecosystem? Do you need to get rid of waste materials?

Don't let the children discuss their roles; secrecy should be maintained. Tell them: "Without telling anyone where, you may choose any spot your heart desires to build your business!"

Now they gather materials to build - sticks, rocks, litter, leaves, dirt, whatever. They construct their work site, shop or complex, still not revealing their work identities.

When all have finished, they may hang their signs over their doors. Now teacher must get discussions going.

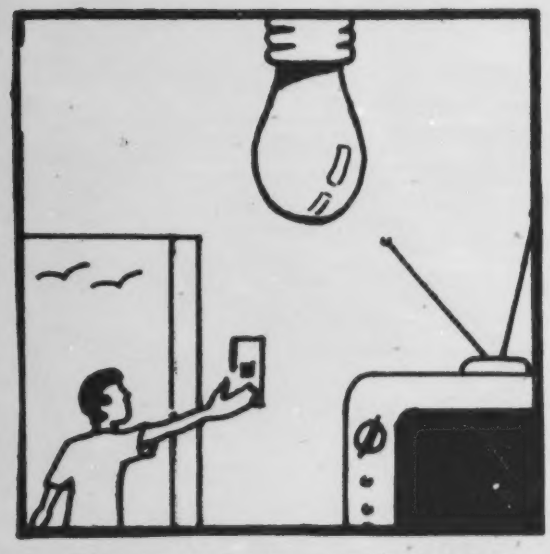
"Look around. See any problems? ... uh, oh ... looks like the rock quarry with its pounding and blasting equipment is right next to the hospital."

"Uh, oh, ... the chemical plant is polluting upstream of the fishery. Uh, oh, the chicken farm is next to the school, phew!"

Give each child peanuts with which to barter and bribe. Let them attempt to work out their problems. Some compromises may be reached but others will have to be brought to court (teacher is the judge). It costs 2 peanuts per customer to go to court. Let them have their say and then give a verdict. Winner gets his peanuts back. Loser must move his establishment and gets no refund.

You'll be surprised how self-perpetuating this game is.

Knights of nature



King Arthur knew that many men have strong arms, keen minds, and adventurous hearts; so he brought them all together by challenging them to fulfill QUESTS for the sake of good.

There are still people living today in whom King Arthur would have recognized those qualities, and so it is our task to channel that energy into acts of good.

This is a 9-day adventure. Each day is spent on a specific quest:

1. recycling
2. wildlife
3. excess packaging, smart consumer buying
4. litter
5. water
6. investigation of pollution sources
7. electricity
8. energy
9. auto pollution/fitness

Each day, concentrate on one topic and discuss it thoroughly with the class.

For instance, electricity. What is it? How do we use it? Name the appliances that depend on it. What do we do that makes us need the appliances? Where does electricity come from? What happens to a river when it is dammed? What is eutrophication? What is silt? What happens to aquatic life above and below the dam? What things are electric now that used to be manual? Why were they changed to electric?

The quest: Challenge yourself today to do as many things without electricity as possible. Keep a journal of ideas you get on how to conserve.

This morning my Mom was making pancakes, so instead of using the electric mixer I spent 5 minutes stirring the mix by hand. On the way to school my Dad and I stopped at his office. Instead of using the elevator so early in the morning we walked the stairs. Tonight I washed my hair. I spent a little more time drying it with my towel by the heater vent instead of using the hairdryer.

1. Recycling - Collect recyclable materials; soft drink bottle selection.
2. Wildlife - Put food out; alternatives to pest homicide; don't buy products that endanger animals.
3. Packaging - Do I need the shampoo in the bottle in the box with the pretty picture or are there alternatives?
4. Litter - Choose a place you'd like to clean up; put up a sign there.
5. Water - When do I use it? How can I conserve it? Some folks are known to blow their nose, throw the tissue into the toilet and get rid of it with 7 gallons of water flush.
6. Pollution sources - This is fieldwork at home, best assigned over the weekend. Exactly where is the smell coming from in my creek? Follow the creek and find out. If an establishment is polluting in some way, it must have a permit and it

must abide by a limit imposed on it by the Environmental Protection Agency. You can call EPA or your county commissioner to have it checked.

7. Electricity - (already discussed)
8. Energy - What are the different types we use? What are the alternatives (sweater versus thermostat)?
9. Auto pollution/Fitness - How often do we use our car when we shouldn't; carpooling; plan before you travel so a second trip isn't necessary; walking, biking, bus, etc.

For those who complete the 9 quests, hold a special knighting ceremony. Use a sword or magic wand to initiate them and post their names on your bulletin board and give them something special to wear to show for their efforts.